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Positive Imagery as an Emotional Amplifier in Bipolar Disorder

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MEMO

From : Dr. Eric CHEUNG,
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Date : 8 June 2011

To : Dr. CHAN Chun Ting
Department of Psychiatry
Kowloon Hospital

It supersedes the memorandum on the same subject dated on 30 May 2011

Dear Dr. Chan,

Re: Appointment as Senior Trainee of the Hong Kong Training Scheme

I refer to your application of the captioned.

Your application has been verified and approved and you are hereby appointed as senior trainee with effect from 1 January 2010. I would like to draw your attention to the requirements of the Part III Examination, in particular with regard to CAC attendance as well as annual evidence-based case reports. Please discuss with your trainer and tutor and visit the College website (www.hkcpsych.org.hk/) for updates.

You are also required to become a Member of the College to sit for the Part III Examination. Please complete the enclosed application form and submit it to **Miss Lucita Chan** (Room 906, the HKAM Jockey Club Building, 99 Wong Chuk Hang Road, Aberdeen, Hong Kong) together with certified true copies of this letter, your HKID card, your MBBS / MBChB diploma and your Medical Council registration certificate.

I wish you every success in your coming career and I hope to see you more in College organised activities.

(Dr Eric CHEUNG)
Chairman, Education Appointment Committee
c/o Castle Peak Hospital

c.c. Trainer – Dr. Alfert TSANG, Associate Consultant, KH
Chairman, Fellowship Selection Committee – c/o Dr. Eric CHEUNG, CPH

Received 21 JUN 2011

Dr C K Ka.

The Hong Kong College of Psychiatrists
PART III EXAMINATION
Application for Project Approval

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Hospital / unit posted: Kowloon Hospital Position: Resident

Date of appointment as senior trainee: January 2010

(Please enclose a copy of the appointment letter - certified true by trainer, tutor or solicitor)

Year intended to sit for the HKCPsych Part III examination: 2012

Proposed title of the project:

Positive Imagery as an Emotional Amplifier in Bipolar Disorder: A Case-Control Study

(Please attach outline of the project using separate sheets)

Has the project been dismissed by the Board of Examiners for further attempts at the Part III examination?
(Yes / No) No

Has ethics approval obtained? (Yes / Pending / NA)Yes___ (Please enclose a certified true copy of the ethics approval if available. If pending ethics approval, please provide evidence that ethics application has been submitted, and certified true copy of ethics approval should then be submitted upon application for examination. Certified true copy of ethics approval should be enclosed in the dissertation on submission too)

Dr NG Man-kin, Ro
[illegible]
Kowloon Hospital

Institution(s) where the project will be conducted:	Confirmation of feasibility and acceptance by head(s) of the institution(s):	
Kowloon Hospital	Signed: Roger Ng	Date: 16 MAY 2011
	Signed:	Date:

Confirmation of feasibility and endorsement by the project supervisor:

Name of supervisor: Dr. Roger Ng Signed: Roger Ng Date: 16th May 2011

Signature of candidate: CT CHAN CHUN TING. Date: 16th May 2011

Chan Chun Ting

Pg 1 of 2

Reply to application (for official use):

[✓] Approved
[ ] Not approved. See reasons in separate sheet.

Signed: ____________ **(Chairperson, Board of Examiners)** **Date:** 30.6.2011

(Dr [illegible])

Chan Chun Ting Pg 2 / 2

醫院管理局
HOSPITAL
AUTHORITY

REC(KC/KE)
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Document No: KCKE
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群策群力爲病人·優質醫護滿杏林
Quality Patient - Centred Care Through Teamwork

Research Ethics Committee
(Kowloon Central / Kowloon East)

c/o Queen Elizabeth Hospital
30 Gascoigne Road Kowloon

Dr NG Man Kin Roger

Chief of Service
Department of Psychiatry
Kowloon Hospital

6 December 2011

Ref: KC/KE-09-0176/ER-3

Dear Dr NG,

REQUEST FOR AMENDMENTS / UPDATE

The REC(KC/KE) members are appointed by the Cluster Chief Executives to review and monitor clinical research independently according to the guidance of Declaration of Helsinki and ICH GCP Guidelines in order to safeguard the rights, safety and well-being of research subjects. It has the authority to approve, require modifications (to secure approval), or disapprove research. This committee has power to terminate/suspend a research at any time if there is evidence to indicate that the above principles and requirements have been violated.

The Committee has reviewed and approved your research application on 6 December 2011 by an expedited process. The approval decision was based on the documents submitted. You are required to adhere to the attached conditions:

Title of Study	Positive imagery as an emotional amplifier in bipolar disorder: A case-control study
Principal Investigator	Dr NG Man Kin Roger, Chief of Service, Dept of Psychiatry, KH
List of Co-investigators	Dr Emily HOLMES, Dept of Psychiatry, Oxford University, UK
	Dr CHAN Chun Ting, Dept of Psychiatry, KH
Amendments submitted 17 November and 6 December 2011	- REC (KC/KE) Protocol Amendment Application Form [KCKE SOP001F7] - Research Protocol - Consent Form [Chinese Version] - Movement of study team member, Dr YIP Ka Chee
Conditions	1. Be compliant with the applicable laws and regulations (including Hong Kong laws), HA policy, professional code of conduct, guidance of ICH GCP and Declaration of Helsinki. 2. Apply a clinical trial certificate from Department of Health if indicated and submit a copy to this committee before the study begins.

Conditions	3. Not deviate from, or make changes to the study protocol without prior written REC approval, except when it is necessary to eliminate immediate hazards to research subjects or when the change involves only logistical or administrative issues. 4. Report the followings to REC(KC/KE): (i) unexpected and serious adverse event (use KCKE SOP001F8)* within 7 calendar days for life-threatening or fatal event and within 15 calendar days for others from the date of first knowledge of the event (ii) study protocol or consent document change (use KCKE SOP001F7)* (iii) new information that may be relevant to a subject's willingness to continue participation in the study. 5. Report study closure (use KCKE SOP001F9b)* by December 2012. 6. Report the study results and submit any relevant publications to REC(KC/KE).

** Download forms from the KCC/KEC intra-net for use*

Dr TSOI Wai Chiu
for Chairman of REC(KC/KE)

cc. Hospital Chief Executive, KH

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Abstract

Objective:

The author assessed whether spontaneous and intrusive prospective imagery is more prevalent in patients with remitted bipolar I disorder than patients with remitted major depressive disorder and non-psychiatric controls.

Method:

The authors recruited 39 participants suffering from remitted bipolar I disorder, 42 participants with remitted major depressive disorder, and 39 non-psychiatric controls with no current or prior history of mental disorder. The psychiatric diagnoses were verified with Structured Clinical Interview for DSM-IV Diagnoses (SCID). Beck Depression Inventory-II (BDI-II) and Young Mania Rating Scale (YMRS) with a priori cut-off scores were then used to further confirm that the recruited participants were in remission from bipolar I disorder or major depressive disorder. Eligible participants then completed a battery of self-administered questionnaires, assessing general use of imagery in daily life and emotional impact of prospective imagery.

Results:

Patients with remitted bipolar I disorder scored higher than patients with major depression in remission, and non-psychiatric controls on measures of general use of imagery in daily life and of the impact of prospective imagery. Compared with patients with major depression in remission and non-psychiatric controls, patients with bipolar I disorder reported a higher median number of personally relevant positive prospective images. Patients with remitted major depressive disorder had higher scores on measures of prospective imagery than non-psychiatric controls. The findings remained significant even after considering the anxiety score as a covariate.

Conclusions:

When compared with patients with major depressive disorder in remission and non-psychiatric controls, patients with remitted bipolar I disorder had a higher tendency to the general use of imagery in daily life and experienced a higher emotional impact of prospective imagery, and they were also more likely to find such prospective imagery intrusive. Such elevated susceptibility to mental imagery may contribute to inter-episode mood instability, manic and depressive recurrences. Future interventions could target mental imagery in the acute and maintenance treatment of bipolar disorders.

Keywords: bipolar disorder, depression, emotion, imagery

Introduction

Bipolar disorder is a public health problem

Bipolar disorder is a highly prevalent disorder that affects up to 5% of the world's population within their life-time (Kessler, Rubinow, Holmes, Abelson, & Zhao, 1997; Weissman, Bland, & Canino, 1996). Bipolar disorder can be a disabling condition that typically starts in the adolescence and runs a chronic, relapsing-remitting course (Carlson & Goodwin, 1973; Goodwin & Jamison, 1990; Kraeplin, 1921). The standardized all-cause mortality ratio among patients with bipolar disorders is increased by approximately two-fold, suggesting that lifespan of patients suffering from bipolar disorder is substantially reduced (Angst & Sellaro, 2000; Guze & Robins, 1970; Harris & Barraclough, 1997). The annual average suicide rate of patients with bipolar disorders is 0.4%, which is 10 to 20 times that of the general population (Angst & Sellaro, 2000; Guze & Robins, 1970; Harris & Barraclough, 1997).

Apart from its impact on morbidity and mortality, bipolar disorder is also associated with marked impairment of psychosocial functioning. A recent 20-year prospective follow-up study on bipolar I and II disorders found that the psycho-social functioning of patients suffering from bipolar disorders varied over time, and during periods of full-blown depression or mania, the functioning was found to be poor. The functioning improved during inter-episode periods. Yet, the presence of sub-threshold mood symptoms during inter-episode periods was found to be associated with substantial impairment in functioning (Goldberg, Harrow, & Grossman, 1995; Judd, et al., 2002; Keck, et al., 1998). It has been reported that such sub-threshold symptoms were not uncommon among patients with bipolar disorders. A number of prospective longitudinal follow-up studies looking at the long-term outcomes of bipolar disorders suggest that many patients experience persistent sub-threshold symptoms and disability even in the absence of frank recurrences (Altshuler, Gitlin, & Mintz, 2006; Judd, Akiskal, & Maser, 1998; Keller, Lavori, & Coryell, 1986).

Happiness and sadness are normal emotions experienced by all mankind. Mania and depression are mood syndromes that can be regarded as lying in the pathological end of mood symptoms, and are also associated with marked disturbances in other areas of life functioning like thought processes, social behaviors, motivation, and psychosocial functioning (Angst & Sellaro, 2000; Carlson & Goodwin, 1973; Everitt, Gourlay, & Kendell, 1971). Bipolar disorder is characterized by intermittent alternate episodes of mania and depression, thereby leading to extreme and unpredictable mood swings. Because of its overlap with normal swings of emotion, bipolar disorders are frequently underdiagnosed or misdiagnosed as impulsive personality traits or conduct problems. Many patients thus do not receive timely and appropriate treatments (Angst, et al., 2002; Duffy, Alda, Hajek, & Grof, 2009; Tijssen, et al., 2010). Because of its chronicity, high mortality and impact on psychosocial functioning, it has been reported as one of the most costly diseases to society (Peele, Xu, & Kupfer, 2003; Woods, 2000; WHO, 2004).

Classification of Bipolar Disorders and Depressive disorders

In DSM-IV and ICD-10, bipolar disorder is conceptualized as a spectrum of disorders occurring on a continuum. The DSM-IV-TR lists three specific subtypes (bipolar I disorder, bipolar II disorder and cyclothymia) and one non-specified subtype known as bipolar disorder not otherwise specified (bipolar disorder NOS) (American Psychiatric Association, 1994). These include bipolar I disorder for patients with one or more manic episodes, bipolar II disorder for patients with one or more hypomanic episode and one or more depressive episode, cyclothymia for patients with a history of hypomanic episodes with periods of depression that do not meet criteria for major depressive episodes, and bipolar disorder not otherwise specified that is diagnosed when the disorder does not fall within a specific subtype. Major depressive disorder is characterized by the presence of one of the two core symptoms (anhedonia and depressed mood) and four out of six secondary symptoms (change in appetite, insomnia or hypersomnia, psychomotor retardation or agitation, fatigue or loss of energy, feelings of worthlessness, diminished concentration, and recurrent thoughts of death or suicide). Unlike bipolar disorder, there is an absence of episodes of hypomania or mania. Multiples studies have confirmed that bipolar disorders and unipolar depression are distinct entities with different genetic heritability, courses of illness, and responses to treatment (Angst, Sellaro, Stassen, & Gamma, 2005; Craddock & Owen, 2005; Kornstein & Schneider, 2001; Li, et al., 2012). Because patients with bipolar disorder may present with depression, patients who present with depression may suffer from either major depressive disorder or a bipolar disorder that would not be recognized until the occurrence of a defining mania or hypomania. Several variables have been found to predict the conversion of major depression into bipolar disorders. The most robust predictors include early age of onset of illness, presence of psychosis, a family history of mania, and poor response to antidepressant treatment (Akiskal, Maser, & Zeller, 1995; Forty, Smith, & Jones, 2008; Perlis, Brown, Baker, & Nierenberg, 2006; Li, et al., 2012; Schaffer, et al., 2010; Winokur, Coryell, Keller, Endicott, & Leon, 1995). Such predictors are important for studies when patients with depression are to be selected as psychiatric controls for comparison with patients with bipolar disorders.

Pharmacological treatment of Bipolar Disorders

The mainstay treatment for bipolar disorders is medication (Beynon, Soares-Weiser, Woolacott, Duffy, & Geddes, 2009). A review of 19 uncontrolled and 3 controlled studies of the use of lithium in acute mania suggested that 60 to 70 percent of patients respond within 7 to 10 days, compared to 40 percent of those receiving placebo (Geddes, Burgess, Hawton, Jamison, & Goodwin, 2004). McElroy et al. reviewed trials of valproate in acute mania, and showed a similar efficacy compared to lithium (McElroy, Keck, Pope, & Hudson, 1992). Recent trials have also suggested that lamotrigine is an effective acute and maintenance treatment of bipolar disorders (Calabrese, et al., 1999; MacRitchie, Geddes, Scott, Haslam, & Goodwin, 2001). Maintenance treatment of bipolar disorders has been reviewed extensively and has found mood stabilizers to be an effective method to reduce the rates of recurrence (Burgess, et al., 2001; Tondo, Baldessarini, Hennen, & Floris, 1998).

Despite significant strides in the pharmacological treatments of bipolar disorders, many patients with bipolar disorders still fail to respond to them, or experience residual symptoms (Burgess, et al., 2001).Studies have reported that up to 50% patients with bipolar I disorder do not recover from acute manic episodes within 1 year, and only 25% achieve full recovery of function (Coryell, et al., 1993; Goldberg, Harrow, & Grossman, 1995; Judd, et al., 2002; Judd, et al., 2003; Judd & Akiskal, 2003). Rates of recurrence averaged 40% to 60% in 1 to 2 years' time even when patients adhered well to pharmacotherapy (Goldberg, Harrow, & Grossman, 1995; Keck, et al., 1998). Patients might spend as much as 47% of their lives in symptomatic states (Goldberg, Harrow, & Grossman, 1995; Judd et al., 2002; Keck, et al., 1998). Furthermore, only about 40% of patients were fully adherent with their medication regimens in the year following an episode of mood recurrence (Sajatovic, Valenstein, Blow, Ganoczy, & Ignacio, 2006). Poor adherence to medications can be related to denial of the illness, side effects of mood stabilizers, and missing the feelings of euphoria during hypomanic phases (Bates, Whitehead, Bolge, & Kim, 2010; Fleck, Keck, Corey, & Strakowski, 2005).

There is therefore a strong rationale in providing psychological interventions for patients suffering from bipolar disorders. Furthermore, multiple studies have found a strong association between psychosocial stressors and the onset and maintenance of bipolar disorders (Allen, 1976; Goodman, et al., 2001; Hayward, Wong, Bright, & Lam, 2002; Goldberg, Harrow, & Grossman, 1995; Johnson, 2005; Kessler, Walters, & Forthofer, 1998; Kieseppa, Partonen, Haukka, Kaprio, & Lonnqvist, 2004). The ceiling on the effectiveness of pharmacotherapy, the evidence of the relationship between environmental stressors and bipolar disorders, and the needs of adjunctive psychosocial treatments in improving the outcome of bipolar disorders have understandably led to recent surge of research on developing effective psychological interventions for bipolar disorders.

Psychological treatments of Bipolar Disorder

Psychoeducation

The assumption behind psychoeducation is that when patients learn about bipolar disorders, develop relapse prevention plans, learn to stay adherent with medications, and implement illness management strategies (keeping regular sleep/wake cycles for example), they would stay well for longer periods of time (Colom, et al., 2003). A randomized, controlled trial of individual psychoeducation showed some benefits of individual psychoeducation for reducing the likelihood of manic recurrences (27% of patients in experimental condition versus 57% in routine care) and the time to first manic recurrence (Perry, Tarrier, Morriss, McCarthy, & Limb, 1999).

Cognitive Behavioral Therapy

Some bipolar patients have pessimistic explanatory styles in the depressive phases and overly optimistic explanatory biases in the manic or hypomanic phases of the illness (Lam, et al., 2003). Lam et al. identified 103 bipolar I and II patients who were in recovery but had had at least three episodes in the past 5 years. Patients were randomly assigned to pharmacotherapy plus 12-18 individual CBT sessions over 6 months or pharmacotherapy plus routine care. The results over 1 year favored the CBT group (44% relapsed) over the routine care group (75% relapsed). Patients in CBT also had fewer hospitalizations and days in the hospital, better social functioning, and better medication adherence than those in routine care (Lam, Hayward, Watkins, Wright, & Sham, 2005). A randomized controlled study by Scott et al. did not find a superior efficacy of CBT over standard care in reducing the rates or recurrence, the duration of illness episodes, or improving the adherence to medication (Scott, et al., 2006). In a recent review of psychosocial interventions in bipolar disorder, Beynon and his associates did not find any conclusive evidence for the role of CBT in preventing relapse from a euthymic state (Beynon, Soares-Weiser, Woolacott, Duffy, & Geddes, 2008).

Interpersonal and Social Rhythm Therapy

The interpersonal and social rhythm therapy approach, an adaptation of interpersonal psychotherapy for depression, derives from the observations that bipolar disorder is often associated with poor interpersonal functioning, and disruptions into sleep/wake cycles can precipitate manic episodes.

In a single-center trial of this modality (Frank, et al., 2005), 175 acutely ill bipolar I patients were assigned randomly to pharmacotherapy and weekly interpersonal and social rhythm therapy (IPSRT) or pharmacotherapy and weekly clinical management (CM) sessions. The results showed that patients receiving IPSRT had increased regularity in social routines that could contribute to an increased time spent in the recovered state. But this effect might have been confounded by an increased time spent in IPSRT sessions compared to the comparator CM group. There was also a lack of evidence to show that IPSRT has a significant effect in reducing time to remission in acute relapses.

In summary, there are limitations in the use of medication and psychological treatment in the management of bipolar disorders. The risk of recurrence within 2 years was close to 50% for patients on medication, and is likely to be much higher for those who are non-adherent to treatment. The evidence for the use of adjunctive psychological interventions such as psychoeducation, family therapy, social rhythm therapy, and cognitive behavioral therapy, is overall conflicting, and is often criticized for inadequate study designs and small sample sizes. It is therefore important to develop more effective treatments for bipolar disorders, both in maintaining recovery, and in the acute treatment during episodes of recurrence.

Mental Imagery

Mental imagery is a powerful mechanism in evoking emotions, and does so through different mechanisms. Firstly, images have a direct influence on emotional systems in the brain, and they are interpreted as being similar to real emotion-arousing events due to overlapping activation patterns between imagery and perception. Secondly, emotions are aroused through the capacity of images to make contact with memories for emotional episodes in the past and reactivate related feeling states (Holmes, Geddes, Colom, & Goodwin, 2008; Holmes & Mathews, 2010).

The effect of mental imagery on evoking emotions is reported to be even stronger than verbal cognition (Holmes & Mathews, 2010). The most studied and understood is post-traumatic stress disorder (PTSD), where powerful emotions can be evoked by involuntary memories in the form of mental imagery (known as 'flashbacks'), with its content reminiscent of the original traumatic event. Mental imagery is also found in many other forms of psychopathology. For example, in people with substance dependencies, related images (for example, past experiences of smoking marijuana) may induce desire or craving for the desired substance (Kavanagh, Andrade, & May, 2005). While mental imagery in PTSD and in substance dependence syndrome might represent memories of past experiences, some patients might also experience mental imagery of future imagined events - prospective imagery. It has been found that patients experiencing past memories in the form of mental imagery also experienced prospective imagery (Holmes & Mathews, 2010).

Imagery can amplify not only aversive states such as anxiety and depression: it may also result in the amplification of positive emotional states (Holmes, Mathews, Dalgleish, & Mackintosh, 2006; Holmes, et al., 2011). Holmes et al. has hypothesized that mental imagery might play a key role in amplifying the positive emotion in mania and in triggering mood instability found in patients with bipolar disorder (Holmes, Geddes, Colom, & Goodwin, 2008). Recent studies by Holmes et al. (2011) have reported that patients with bipolar disorder had higher levels of general use of imagery in daily life and greater impact of prospective imagery than non-psychiatric controls. Hales, Deeprose, Goodwin, & Holmes (2011) also found that bipolar patients with history of suicide experienced a greater impact of prospective imagery than patients with depression and history of suicide. Furthermore, Holmes et al. (2011) reported that bipolar patients with inter-episode mood instability had higher levels on prospective imagery. As measured by a self-administered mood questionnaire using mobile phone short message system (SMS) as prompts, bipolar patients with inter-episode mood instability were found to have experienced a greater impact of prospective imagery than bipolar patients with inter-episode mood stability (Holmes, et al., 2011). Yet these studies were small in sample size and were restricted to Caucasian ethnicity, it is not clear whether such findings are unique to bipolar patients of Caucasian ethnicity. Furthermore, they have not excluded patients with other comorbid diagnoses, and it is possible that the increased impact of prospective imagery might be related to comorbid disorders like anxiety disorders, which are found to be commonly associated with increased occurrences of mental imagery (Hackmann & Holmes, 2004).

Study design

Objectives of the study

This study aims to understand the relationship of mental imagery measures and bipolar I disorder in remission. It also aims to understand how these measures might differ between patient suffering from remitted bipolar disorder, remitted major depressive disorder and non-psychiatric controls.

Hypotheses of the study

1. Patients in remission from bipolar I disorder would have greater tendency of the use of imagery in daily life, and experience greater emotional impact from future-oriented, personally relevant mental imagery (prospective imagery) compared with non-psychiatric controls
2. Patients in remission from bipolar I disorder would have greater tendency of the use of imagery in daily life, and experience greater emotional impact from future-oriented, personally relevant mental imagery (prospective imagery) compared with patients in remission from major depressive disorder
3. Patients in remission from major depressive disorder would experience greater emotional impact from future-oriented, personally relevant mental imagery (prospective imagery) compared with non-psychiatric controls

Method

The design was a cross-sectional case-control study with three participant groups (remitted bipolar I group, remitted unipolar depressed control group, non-psychiatric control group), which were broadly matched for age and gender.

Participants

Participants with bipolar I disorder were recruited from Kowloon Hospital's psychiatric outpatient clinic. The Department of Psychiatry of Kowloon Hospital provides public psychiatric care to a population of about 550,000 people residing the geographical area of

Kowloon Central Cluster of Hong Kong. In Hong Kong, about 95% of patients are under care in the regional psychiatric center of their residential area, due to the policy of cluster-based care concept and the relative lack of private psychiatric outpatient and inpatient care in Hong Kong. A list of all patients with a diagnosis of bipolar I disorder was obtained from the psychiatric clinical information system for routine service planning purpose. Bipolar I patients were then randomly selected for further screening of eligibility, if the last two digits of their outpatient registration numbers were identical to the random numbers generated by the statistical software (STATA version 10). These randomly selected bipolar patients were then approached by their responsible doctors for a separately arranged independent assessment of their mental competence to give informed consent. The potential participants were also explored about their interest in participating in this study. If they were deemed to be mentally competent and expressed interest in participating in the study, the investigator would then approach these potential participants for further screening and informed consent.

The inclusion criteria for the bipolar patient sample were:(1) Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) diagnosis of a bipolar I disorder, currently in remission;(2) aged 18 or above; (3) ethnic Chinese with the ability to read and write Chinese; (4) a total score of less than 21 on the Beck Depression Inventory-II (BDI-II) (5) and a total score of less than 7 on the Young's Mania Rating Scale (YMRS) . Diagnoses were confirmed by Structured Clinical Interview for DSM-IV (SCID-TR). Individuals were excluded if they: (1) had an additional axis 1 or 2 DSM-IV-TR psychiatric diagnosis; (2) had a clear organic cause for their disorder; (3) had psychiatric admissions within the recent 3 months for their psychiatric conditions; (4) were actively suicidal; (5) had received electro-convulsive therapy within the past 12 months; (6) suffered from a life-threatening physical condition.

Inclusion and exclusion criteria for the depressed control sample were similar to the above, except that they held a DSM-IV-TR diagnosis of a major depressive disorder in remission or recurrent depressive disorder, currently in remission. The potential participants were similarly identified from the clinical information register, selected randomly using two-digit random numbers generated by STATA-10, and then approached by the team investigators as in the above procedure for bipolar participants.

Community non-psychiatric controls were recruited from a General Outpatient Clinic that was located within a 5-minute walk from Kowloon Hospital. General Outpatient Clinic provides medical care to patients with minor physical problems (like flu) or stable medical conditions (like diabetes mellitus or hypertension) serving the population of the same geographical region. Inclusion criteria were (1) not meeting any lifetime DSM-IV-TR diagnosis; (2) aged 18 or above; (3) ethnic Chinese who is able to read and write Chinese; (4) having a total score of BDI-II of less than 21; (5) a total score of YMRS of less than 7; and (6) expressed willingness to give informed consent to their participation in the study. The exclusion criteria were: (1) having received psychiatric treatment currently or in the past; and (2) having a family history of major depressive or bipolar disorders. Community non-psychiatric controls were approached by team investigators while they were attending the captioned clinic for medical follow-up.

Procedures

Ethics approval was obtained from the Kowloon Central and Kowloon West Cluster Research Ethics Committee. Informed consent was obtained for each identified participant. Diagnostic suitability of the participants for the study was confirmed by Structured Clinical Interview for DSM-IV-TR Diagnosis (SCID-DSM-TR) (American Psychiatric Association, 1994). They were then assessed with the Beck Depression Inventory-II (BDI-II) (Beck, Steer, & Brown, 1996) and Young Mania Rating Scale (YMRS) (Young, Biggs, Ziegler, & Meyer, 1978). Those found suitable for the study were then given a folder containing the following self-administered questionnaires: Impact of Future Events Scale (IFES) (Deeprose, Malik, & Holmes, 2011), Spontaneous Use of Imagery Scale (SUIS) (Reisberg, Pearson, & Kosslyn, 2003), and Beck Anxiety Inventory (BAI) (Beck & Steer, 1993). Participants were debriefed about the study and were paid HKD 100 as transport allowance.

Should potential participants for the community non-psychiatric control group be identified to be suffering from a possible psychiatric disorder either during their interaction with the researcher or as judged by an elevated BDI-II or YMRS score, they would be educated about their conditions. With their verbal consent, the chief nurse at the General Outpatient Clinic would then also be alerted about these patients' needs and then referred for further management at the Kowloon Hospital Psychiatric Outpatient Clinic. They would be placed under the appropriate group in the study if applicable.

Measures

Demographic and baseline characteristics

Baseline demographic and clinical characteristics including age, gender, employment status, family history of mental illness, number of past psychiatric admissions, the number of suicide attempts were collected. The number of psychiatric admissions and the number of suicide attempts were verified with the Clinical Information System wherever possible.

The following measures were used.

1. Structured Clinical Interview of DSM-IV Axis-I Psychiatric Diagnoses (SCID-DSM-IV-TR) (American Psychiatric Association, 1994)

This is a semi-structured clinical interview that classifies participants' psychiatric diagnoses according to DSM-IV classification of psychiatric disorders. This is regarded as the gold standard in diagnosing psychiatric disorders. The SCID-I Chinese version has been validated in Hong Kong Chinese with good validity and reliability (So, Kam, & Leung, 2003). The SCID-I were administered by the author who has been trained to achieve a criterion inter-rater reliability of kappa agreement of at least 0.70, a moderate to good level of inter-rater agreement, with an independent experienced psychiatrist (the project supervisor) in the sections of mood disorders, schizophrenia and other psychotic disorders, and anxiety disorders, before the commencement of the study. For the present study, the author achieved an excellent inter-rater reliability with the project supervisor in the administration of SCID interview (kappa agreement (k) for mood disorder section=0.95; k for schizophrenia and psychotic disorder section=0.96; k for anxiety disorder section=0.96).

2. The Beck Depression Inventory-II (BDI-II) (Beck, Steer, & Brown, 1996)

The BDI-II is a 21-item self-report measure that assesses the severity of current depression. Following the recommendations of Beck et al. (1996), a cut-off point of 21 is used to discriminate between clinically depressed and non-depressed participants. A validated Chinese version is used (Bryne, Stewart, & Lee, 2004), which has a good validity and reliability (6-month test-retest reliability=0.74; internal consistency: Cronbach alpha=0.91)

3. The Young Mania Rating Scale (YMRS) (Young, Biggs, Ziegler, & Meyer, 1978)

Young Mania Rating Scale is a reliable and widely used rating scale. It is an 11-item clinician-administered rating scale used to assess the severity of mania. The scale is scored by the interviewer based on the subjective reports of the participant, coupled with the interviewer's own observation of participant's behavior during the interview. In mania trials, scores of 20 or above are commonly required for inclusion (Tohen, Goldberg, & Gonzalez-Pinto Arrillaga, 2003). Following treatment, participants scoring 7 or less are considered to be in remission. A score of between 12 and 20 has been considered as hypomanic (Chengappa, Baker, & Shao, 2003). An inter-rater reliability of Spearman rank correlation of at least 0.85 was established between the author and an independent experienced psychiatrist (the project supervisor) before the commencement of the study.

4. Impact of Future Events Scale (IFES) (Deeprose, Malik, & Holmes, 2011)

This scale is adapted from the Impact of Events Scale-R (IES-R) (Weiss & Marmar, 1996) to identify intrusive prospective imagery and its emotional impact. Instead of asking the participant to identify one single traumatic event as in the Impact of Events Scale-Revised, the IFES requires the participant to identify three future imagined events and indicate whether each event is 'positive' or 'negative'. In scoring the IFES, the number of negative events and positive events per individual is summed separately. The IFES consisted of 24 items, rated on a scale from 0 ('not at all') to 4 ('extremely'). Scoring for the IFES is calculated as per the IES-R: a summation of the total score of responses. In IES-R, three sub-scales (intrusion, avoidance and hypervigilance) are generated from summing up individual items belonging to the relevant themes.

In a validation study of the scale, it was found that compared to a non-dysphoric group, a mild dysphoric group had significantly higher IFES Total Scores (Deeprose & Holmes, 2010). It was concluded that the IFES provided a measure of the impact of prospective imagery, with sensitivity to group differences based on depression scores. In a more recent validation study of the scale (Deeprose, Malik, & Holmes, 2011), IFES Total Score significantly, and positively correlated with the Mood Disorder Questionnaire (MDQ) (Hirschfield, et al., 2000). The MDQ is cited in the NICE guidelines as a questionnaire for assessing bipolar disorder in secondary care (National Institute of Clinical Excellence, 2006, no. 38, p. 15). This suggests that those at higher risk for developing bipolar disorder have high IFES Total Score.

5. The Spontaneous Use of Imagery Scale (SUIS) (Reisberg, Pearson, & Kosslyn, 2003)

The SUIS measures the tendency to use imagery in everyday life. This questionnaire consists of 12 items, for example: 'when I think about a series of errands I must do, I visualize the stores I will visit'. Each item is rated on a 5-point scale, ranging from 5 'if a description is always completely appropriate' to 1 'if it is never appropriate'. A significant relationship between scores on the SUIS and the Vividness of Imagery Scale (Marks, 1973) has been demonstrated with high-vividness imagers reporting higher use of imagery than low-vividness imagers (Reisberg, Pearson, & Kosslyn, 2003), suggesting that they measure a related construct.

6. Beck Anxiety Inventory (BAI) (Beck & Steer, 1993)

This is a commonly used scale that measures the level of anxiety with good validity and reliability. The validated Chinese version was used (Che, Lu, Chen, Chang, & Li, 2006), which is a highly valid and reliable scale, with two factor structures of somatic and psychic anxiety that explains 58% of total variance as well as high internal consistency (Cronbach alpha=0.95; Guttman split-half reliability = 0.91). Anxiety level was measured as it could be a potential confounder of the relationship between mental imagery and the status of mood disorders.

Translation and validation of the SUIS and IFES

The translation and validation of the Chinese versions of the SUIS and IFES were done by a panel of mental health experts involved in the Hong Kong Mental Morbidity Survey. The group responsible consisted of 3 psychiatrists, 3 psychologists, and 3 occupational therapists. All members of the team were researchers on affective disorders and had experience in cross-cultural translation of psychiatric rating instruments. Each member translated the SUIS and IFES independently and subsequently met together to decide on a consensus translation. Back translation of the scales, performed by another bilingual psychiatrist, was found to be satisfactory.

The translated SUIS and IFES were given to a group of hospital staff for completion and local validation (n = 10). The scales were completed again by the same staff 2 weeks after the first round of completion for the assessment of test-retest reliability.

The psychometric properties of SUIS are summarized as follows: Cronbach's alpha = 0.96; Guttman split-half reliability = 0.85; item to total score correlations as measured by Pearson's correlations= 0.51 - 0.83; 2-week test-retest reliability as measured by Pearson's correlations = 0.89; paired t-test comparing mean SUIS at week 0 and SUIS at week 2; mean difference = 2.5; SE difference = 5.74; p-value = 0.67).

The psychometric properties of IFES are summarized as follows: Cronbach's alpha = 0.92; Guttman split-half reliability = 0.85; item to total Pearson's correlations = 0.43 - 0.96; 2-week test-retest reliability as measured by Pearson's correlations = 0.86; paired t-test between mean IFES total in week 0 and mean IFES total score in week 2; mean difference = 1.6; SE difference = 9.44; p-value = 0.87).

Statistical analysis

Analyses were carried out using STATA version 10 for Mac. Summary statistics for continuous variables are presented as means with standard deviations or medians with interquartile ranges. Summary statistics for discrete and nominal variables are presented as percentages. For the comparison of baseline clinical and demographic characteristics, characteristics of imagery measures between groups, T-test, ANOVA, and ANCOVA were used for normally distributed continuous variables, Mann-Whitney and Kruskal-Wallis tests were used for non-normal continuous variables and discrete variables, while Chi-square test was used for nominal data. Pearson's correlation was used to analyze the linear relationships between imagery measures, anxiety scores, and age. Data normality was checked using histograms and Skewness / Kurtosis test. For significant findings in ANOVA and ANCOVA, post hoc tests were conducted by making pairwise comparisons with Bonferroni corrections. All tests were considered significant at alpha = 0.05 (2-tailed).

Results

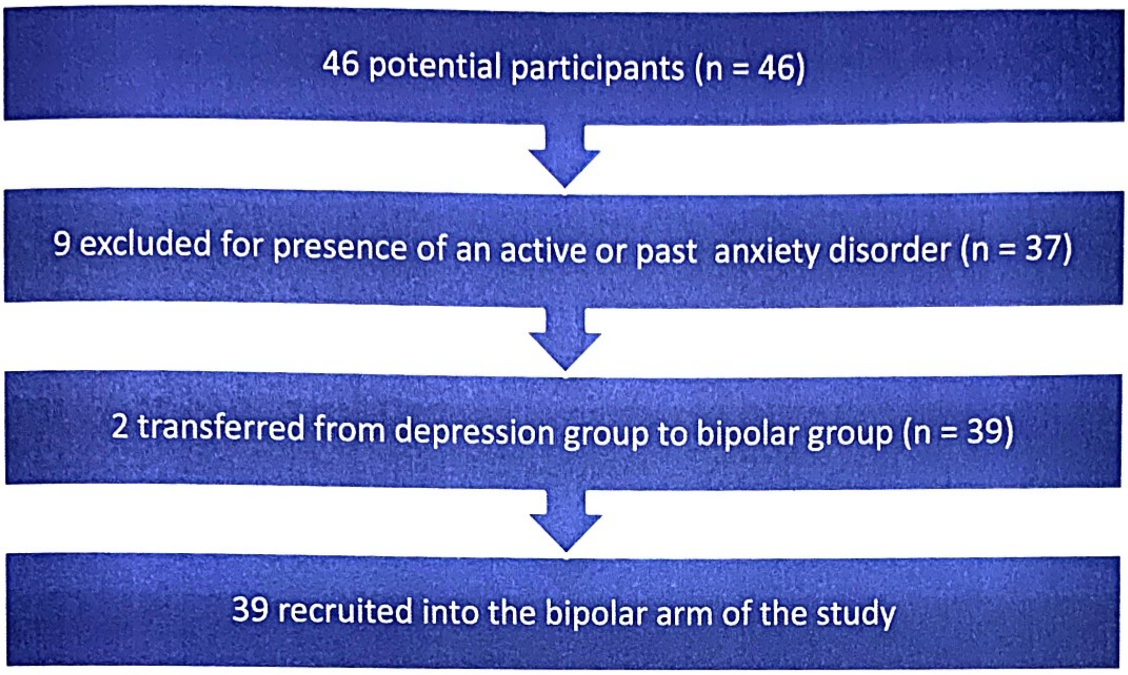
Baseline characteristics

A total of 39 patients with bipolar disorder, 42 patients with depression, and 39 non-psychiatric control subjects were included in the analyses.

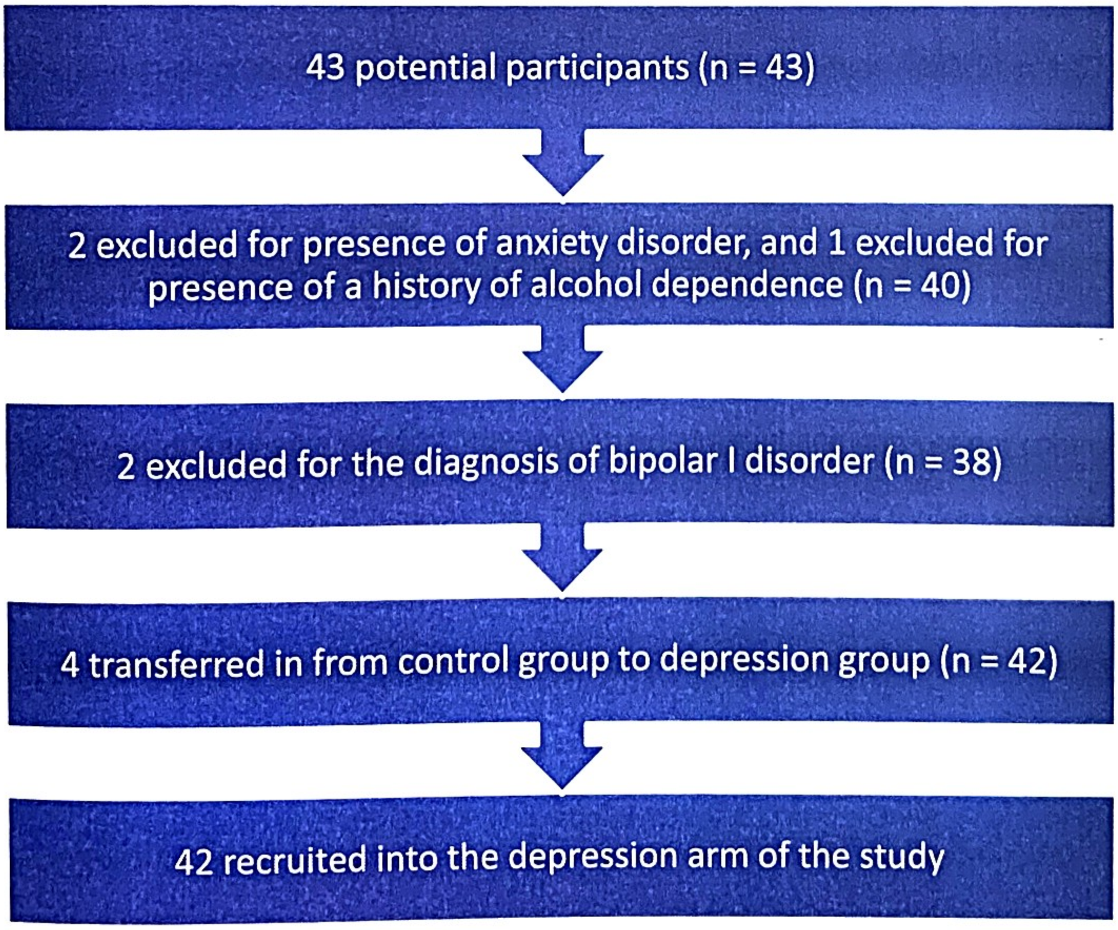
None of the approached subjects in the 3 groups refused to participate in the study. 46 potential bipolar subjects were approached, and 9 were excluded due to the comorbid diagnosis of an anxiety disorder. In the depression group, 43 potential depression subjects were approached and 2 were excluded due to the comorbid diagnosis of an anxiety disorder, and 1 was excluded due to a past history of alcohol dependence. 2 patients were transferred from the depressed group to the bipolar group due to the finding of a history of mania during interview, and 4 subjects were transferred from the control group to the depression group due to the diagnosis of a history of depressive disorder. With the healthy-control group, 47 potential subjects were approached, and 4 were referred to the Kowloon Hospital Psychiatric Outpatient Clinic for further management due to the diagnosis of an active depressive disorder. 4 more subjects were found to have a past history of depression in remission, and they were placed under the depression group of the study.

On the whole, 81% of approached bipolar subjects, 88% of approached depression subjects, and 83% of non-psychiatric control subjects were recruited into their respective groups for the study.

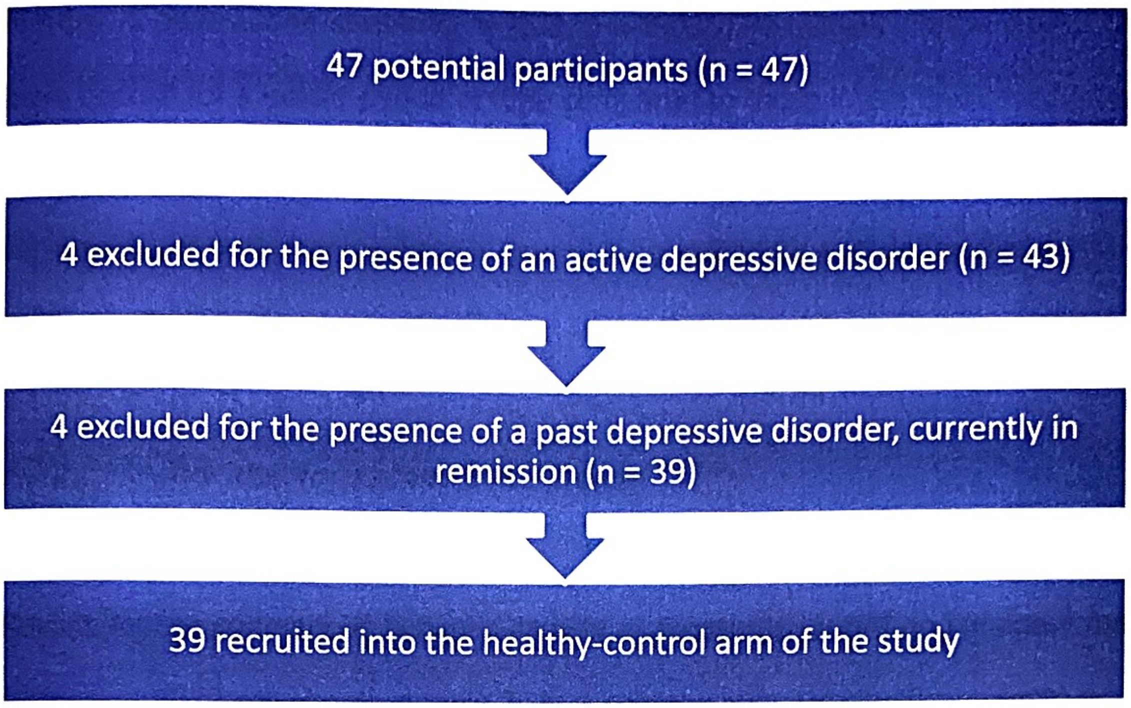
Bipolar Group


46 potential participants (n = 46)
9 excluded for presence of an active or past anxiety disorder (n = 37)
2 transferred from depression group to bipolar group (n = 39)
39 recruited into the bipolar arm of the study

Depression Group


43 potential participants (n = 43)
2 excluded for presence of anxiety disorder, and 1 excluded for presence of a history of alcohol dependence (n = 40)
2 excluded for the diagnosis of bipolar I disorder (n = 38)
4 transferred in from control group to depression group (n = 42)
42 recruited into the depression arm of the study

Non-psychiatric Control Group


47 potential participants (n = 47)
4 excluded for the presence of an active depressive disorder (n = 43)
4 excluded for the presence of a past depressive disorder, currently in remission (n = 39)
39 recruited into the healthy-control arm of the study

The demographic and clinical characteristics are presented in table 1. There was a similar general female predominance of participants across the 3 groups (chi2(2) = 1.57, p = 0.456), and their educational background were similar (F (2, 117) = 0.75, p = 0.56). The mean age of the bipolar group was younger than that of the depressed and non-psychiatric control groups (F (2, 117) = 6.71, p = 0.007).

The bipolar group had a higher YMRS than the depressed and non-patient control groups, but the mean score was still lower than the a priori cut-off score for inclusion into the study(mean = 2.0, SD = 2.10, 95% CI [1.36, 2.69]), (F (2, 117) = 25.45, p < 0.001). The depressed group had both a higher BDI-II score (mean = 9.0, SD = 6.38, 95%CI [7.03, 10.92]), (F (2,117) = 10.47, p < 0.001) and a higher BAI score (mean = 14.4, SD = 10.67, 95%CI [11.14, 17.66]) than the bipolar and the non-psychiatric control groups.

Compared to participants in the depressed group, those in the bipolar group had a higher number of past suicide attempt(z = 2.23, p = 0.026).Participants in the bipolar group have been ill for a longer period of time compared to those in the depressed group (t = 2.74, p = 0.004)participants in the bipolar group also had a higher number of psychiatric admissions for both manic episodes (z = 4.95, p < 0.001), and depressive episodes (z = 2.34, p = 0.019).

Mental imagery measures across three groups

Results for the correlations between anxiety as measured by BAI and imagery measures (SUIS and IFES) are shown in table 2. As a cohort, there are significant positive correlations between BAI score and the IFES total and IFES sub-scores (except for IFES-hypervigilance). This was consistent with results from previous studies that anxiety is an important factor associated with imagery measures (Day, Holmes, & Hackmann, 2004). Age is inversely associated with SUIS score, but not associated with the IFES total or IFES sub-scores. There is no significant correlation between SUIS and IFES scores (Pearson correlations range from 0.15 to 0.25; p>0.05 for all correlations). IFES total score is significantly associated with all IFES-subscores (intrusion sub-score, Pearson correlation (r)=0.92; avoidance sub-score, r=0.91; hypervigilance sub-score, r=0.91; all p-values<0.01).

Results comparing the general use of imagery as measured by SUIS and prospective imagery as measured by IFES scores across the 3 groups are shown in table 3. As anxiety is an important theoretical confounder and is also correlated significantly with both SUIS and IFES subscores as shown in table 2, BAI score was taken as the co-variate in the

ANCOVA analyses. Significant differences found in the ANCOVA were then further examined between each of the two groups using post-hoc Bonferroni test.

Among the 3 groups, there is a statistically significant difference in SUIS scores across the three groups ($F = 3.959$, $p < 0.001$). Post-hoc Bonferroni tests have confirmed that participants in the bipolar group had a significantly higher SUIS score than the depressed (bipolar group mean = 44.2, SD = 9.63, 95% CI [41.10, 47.21]; depressed group mean = 27.1, SD = 6.77; mean difference = -17.1, post-hoc t-test $p < 0.001$) and the non-psychiatric control groups (bipolar group mean = 44.2, SD = 9.75, 95% CI [41.10, 47.21]; non-psychiatric control mean = 32.6, SD = 9.75, 95% CI [29.40, 35.72]; mean difference = -11.6, post-hoc t-test $p < 0.001$). However, mean SUIS of the depressed group was lower than both bipolar and non-patient psychiatric control groups (depressed group mean = 27.1, SD= 6.77, 95% CI [25.00, 29.14]; non-psychiatric control mean = 32.6, SD = 9.75, 95% CI [29.40, 35.72]; $F(2, 117) = 39.59$, post-hoc t-test, $p < 0.05$).

The mean total IFES scores were elevated in both the bipolar group (bipolar group mean = 39.0, SD = 19.74, 95% CI [32.72, 45.23]), and depressed group (depressed group mean = 41.2, SD = 19.43, 95% CI [35.30, 47.17]) when compared with the non-psychiatric control group, with those in the bipolar group showing the highest mean IFES total scores ($F(2, 117) = 12.1$, $p < 0.001$). There is nevertheless no significant difference in the mean IFES total score between the bipolar group and the depressed group. The individual IFES sub-scores in the intrusion, avoidance, and hypervigilance domains were significantly elevated in both the bipolar and depressed groups when compared with the non-patient control group (see table 3). Furthermore, the bipolar group had a significantly higher mean IFES intrusion sub-score compared with the control group (bipolar group mean = 16.9, SD = 7.33, 95% CI [14.5, 19.2]; non-psychiatric group mean = 8.0, SD = 7.57, 95% CI [5.5, 10.4], mean difference = 8.9, SE = 1.69; $p < 0.001$. However, there is no significant difference between the bipolar and depressed groups in the IFES avoidance and hyper-vigilance subscores. As there is a significant difference in mean age between the three groups and age is associated with SUIS score, the ANCOVA was re-run with co-variates of both BAI score and age being controlled for SUIS, the result remains similar (mean difference between bipolar and depressed groups=17.1; SE=2.16; $p<0.001$; mean difference between bipolar and control groups=11.6; SE=2.10; $p<0.001$; mean difference between depressed and control groups=-4.3, SE=2.10; $p=0.04$). Bipolar group also had a higher median number of positive images of two when compared to the depressed and non-patient control groups (Kruskal-Wallis test; $p=0.06$), approaching marginal significance. There is no significant difference in the median number of negative images between the three groups (Kruskal-Wallis test; $p=0.23$)

Discussion

Apart from the cognitive process of verbal reasoning, mental images can exert a powerful effect on emotions. There has been extensive work done on the relationship between mental images and anxiety disorders (Ehlers, Hackmann, & Michael, 2004; Grey & Holmes, 2008; Hackmann, Clark, & McManus, 2000; Hackmann, Day, & Holmes, 2009; Hackmann & Holmes, 2004; Hirsch & Holmes, 2007; Holmes, 2007; Holmes, Arntz, & Smucker, 2007; Pratt, Cooper, & Hackmann, 2004; Speckens, Hackmann, Ehlers, & Cuthbert, 2007), and mental imagery in other psychiatric illnesses such as bipolar disorders has been receiving increased attention in the recent decade (Holmes, Mathews, Dalgleish, & Mackintosh, 2006; Holmes, et al., 2011).

This study showed that, when compared to non-patient controls and remitted patients with depression, patients with bipolar disorder in remission have a higher tendency to the general use of imagery in daily life, and in prospective imagery. We also found that patients with bipolar disorder in remission have a trend toward an increased reporting of positive images. The current findings were consistent with the recent findings of increased level of prospective imagery among stable patients with bipolar disorder when compared with volunteer controls (Holmes, et al., 2011). However, contrary to the findings of Hales et al. (2011), the level of prospective imagery in the current study was similar between the bipolar and depressed groups. Yet it is worth noting that, in Hales et al.'s study (Hales, Deeprose, Goodwin, & Holmes, 2011), the bipolar sample was still actively depressed with a mean BDI-II score of 27.3 (SD=11.89) and similar to the depressed sample (mean BDI-II score of 27.3; SD =7.86). In other words, Hales et al. (2011) might be comparing bipolar depression against unipolar depression, which is different from the remitted sample groups of the current study. The above findings suggest that patients with bipolar disorder, even in remission, are more prone to thinking in images in daily life than patients with depression and people without psychiatric disorders (as reflected by the higher mean SUIS score). Furthermore, the occurrence of these mental images also exerts a greater emotional impact on bipolar patients than people without psychiatric disorders as reflected by the increase in mean IFES total and mean IFES sub-scores. As suggested in the current study, the content of the mental images of bipolar patients during remission, is still more likely about personally relevant positive events than people without psychiatric disorders. It is also noteworthy that remitted bipolar patients had a similar number of negative images as remitted depressed patients and non-patient controls.

The above findings provide an interesting hypothesis about the mechanism of recurrence of mood episode in patients suffering from bipolar disorder. A high propensity of imagining personally relevant future positive events in daily life, combined with a high emotional impact experienced from such images, may be an important amplifier of positive emotion. Previous studies have suggested that mental imagery might exert a powerful effect on positive emotion (Holmes, Geddes, Colom, & Goodwin, 2008), might represent the presence of a real goal to be achieved (Conway & Pleydell-Pearce, 2000), and might increase the perception of the likelihood of occurrence of an imagined event (Libby, Shaeffer, Eibach, & Slemmer, 2007). The occurrence of a positive image in the mind's eye, against the background of high emotional impact from mental imagery, might possibly lead to an increased conviction about the likelihood of the occurrence of the imagined event in reality, and trigger the onset of elated and excited mood. The presence of an elated mood, coupled with an increased belief about positive outcome as depicted in the positive image, might lead to an increased willingness to perform risky behaviors, reduce sleep, and engage in goal-pursuit activities. Recent studies have suggested that such increased approach to rewards and goal pursuit might be risk factors for mania (Alloy, Bender, Whitehouse, Wagner, & Liu, 2012; Johnson, 2005). The opposite effect on emotion might occur when patients with bipolar disorder experience a personally relevant future image of negative content. However, the above sequence of the cascade of events is highly speculative and awaits further studies for confirmation.

Past studies have found a high comorbidity of anxiety disorders in bipolar disorders, and depression, up to 90% (Merikangas, et al., 2007) and 50% (Kessler, et al., 2003) respectively.

According to the hypothesis of Holmes et al. (Holmes, Geddes, Colom, & Goodwin, 2008) on the role of mental imagery in amplifying bipolar disorder, anxiety plays a key role in the trigger and maintenance of such mental imagery. As anxiety is associated with increased level of mental imagery (Day, Holmes, & Hackmann, 2004; Holmes & Mathews, 2010), anxiety commonly experienced by bipolar patients might lead to a further escalation in the occurrence of mental imagery. What the current study has added to this hypothesis is that bipolar patients have a high tendency to use imagery in daily life and experience great emotional impact from such mental imagery, even in the absence of comorbid anxiety disorders or when levels of anxiety symptoms are being statistically controlled. The presence of comorbid anxiety disorder might then play an additive role in increasing the levels of mental imagery on top of an already increased level of mental imagery inherent in bipolar disorders, though this hypothesis is again highly speculative. Previous studies have supported that bipolar patients with comorbid anxiety disorders have shorter euthymic periods (Simon, et al., 2004) and more rapid switching in mood (MacKinnon, et al., 2002; MacKinon, et al., 2003). Recent studies have also supported that the presence of anxiety symptoms in bipolar disorder is associated with more weeks in mood episodes (Coryell, et al., 2009; Coryell, et al., 2012). As of today, however, the amplifying role of anxiety on mental imagery in bipolar disorder remains highly speculative.

Another interesting finding in the current study is that patients in remission of depression actually experienced similarly high levels of emotional impact from mental imagery as remitted bipolar patients. Morina et al. (2011) found that depressed patients had higher levels of intrusive prospective imagery (as measured by IFES) than normal controls. They have also found depressed patients had higher mean number of personally relevant negative images as measured by IFES than the normal controls (a mean of 1.4 negative images in depressed group vs. 0.8 in normal controls). However, the mean Hamilton Anxiety and Depression Scale score (HADS) of the depressed sample in Morina et al.'s study (2011) (mean HADS = 12.9; SD=3.5) was well above the recommended cut-off score of 8 (Bjelland, Dahl, Haug, & Neckelmann, 2002), suggesting that the sample was likely to be actively depressed. The current study therefore adds further evidence that depressed patients, even in remission, still experienced greater emotional impact from prospective mental imagery than normal controls. The crucial difference between the current findings from Morina et al. study (2011) is that the median number of negative images in the depressed group was not significantly different from the bipolar and the non-psychiatric control groups. Another interesting finding in the current study is that depressed patients, even in remission, had a lower median number of positive images compared with normal controls. Holmes et al. (2009) has found that people with high dysphoria (mean BDI-II=20.5; SD=7.61) had poorer ability to vividly imagine positive future events than people with low dysphoria (mean BDI-II=3.2; SD=2.06). Patel et al. (2007) has also found that actively depressed patients (mean BDI-II=33.7; SD=7.94) experienced intrusive, distressing and recurrent images of death, illness and interpersonal crises. These findings suggest that an excess of negative images and a deficit in positive images might be associated with active depressive symptoms. Such excess of negative images, which is absent in remission, might trigger a recurrence of depressive episode. Last but not least, the current study has found that depressed group had a lower tendency of use of general imagery when compared with bipolar and non-psychiatric control groups. What is intriguing in this finding is that remitted depressed group had an even lower tendency of use of general imagery than non-psychiatric control groups. Our research team has found that this tendency of general use of imagery is inversely correlated with problem-solving ability (unpublished finding). It is not clear whether the current finding is related to the lowered problem-solving skills found in patients suffering from depression.

This study has several limitations. First, the sample was a relatively small one. Although the subjects were randomly selected from the clinic patient pool, the participants voluntarily agreed to participate in a study that they were told could take over 1 hour. Thus they would represent a particularly motivated patient group who was agreeable to take part in such a study. However, the refusal rate of participation by eligible patients in this study was not high.

Second, as this was a public specialist outpatient clinic, there is a possibility of selection bias which could limit the generalizability of the findings to people with milder forms of bipolar disorder in the community as a whole. However, as over 95% of patients suffering from mental health problems is under care of public care setting, the selected sample would likely be representative of the bipolar and depressed patients requiring psychiatric care in a well-defined geographical region.

Third, patients suffering from bipolar disorders and major depressive disorders have been found to have a high co-morbidity with anxiety disorders. One might question whether the selection of patients with absence of such comorbidities might select a particularly stable or special group of patients with affective disorders. However, in the current study, there is a reasonably low rate of potential participants being screened out by SCID interviews due to the presence of anxiety disorders. Indeed a recent epidemiological study conducted in Taiwan has found that Chinese patients suffering from bipolar disorders and depressive disorder have lower rates of comorbid anxiety disorders than the Western samples (Chang, et al., 2012)

Fourth, the current non-psychiatric control group was recruited from a general outpatient clinic. Previous literature has suggested that around 20% of patients attending a general outpatient clinic for chronic health problems suffered from psychiatric disorders (Goldberg & Blackwell, 1970). The current study, nevertheless, had taken stringent steps to rule out the presence of psychiatric disorders by conducting the SCID interviews and by excluding patients with current or past use of psychiatric treatment, as well as family history of affective disorders. The use of patients from this outpatient clinic has the added strength that these non-psychiatric control patients would similarly receive psychiatric care in the same clinic in the event of developing psychiatric disorders. This choice of non-psychiatric controls would thereby control multiple known and unknown confounders of the relation between mental imagery and affective disorders.

Fifth, associations between mental imagery measures and diagnostic groups could not be answered by the present study due to its case-control design. Instead of mental imagery playing a key role in the trigger of mood episodes in affective disorders, it is equally plausible that the heightened imagery measures might be 'scars' of the previous affective episodes and may have no role to play in triggering future recurrences of mood episodes. Prospective studies of larger and more representative samples are required to examine the strengths of the associations found and the direction of effects.

In conclusion, the current study supports that patients suffering from bipolar I disorder, even in remission, have a higher tendency of use of general imagery in daily life than people with no psychiatric disorders, and experience greater emotional impact from images of personally relevant future events than people with no psychiatric disorders. Furthermore, they also have a higher number of positive future images during the period of remission. These findings provide further support to the hypothesis that mental imagery may be an emotional amplifier in bipolar disorders. If the above findings are being replicated in further studies, mental imagery might be an important therapeutic target in future development of psychological interventions for bipolar disorders.

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Table 1
Demographic and clinical characteristics of patients with bipolar disorder, depression, and healthy-controls.

	1. Bipolar (n = 39)	**2. Depression (n = 42)**	**3. Non-patient control (n = 39)**	**Post-hoc pairwise comparisons (1 vs. 2) (1 vs. 3) (2 vs. 3)**
Age in years (SD)	42.4 (10.33)	49.6 (10.02)	48.5 (7.53)	p = 0.003* p = 0.015* p = 1.000
Sex (male : female) %	31% : 69%	33% : 67%	44% : 56%	
Years of education (SD)	10.6 (3.07)	9.6 (4.35)	10.0 (5.20)	p = 0.864 p = 1.000 p = 1.000
Positive family history of mental illness (%)	20.5%	16.7%	-	
Duration of illness in years (SD)	10.8 (10.00)**	5.8 (6.27)	-	
Median number of past psychiatric admissions for mania (IQR)	1# (0 – 3)	0 (0 – 0)	-	
Median number of past psychiatric admissions for depression (IQR)	0# (0 – 1)	0 (0 – 0)	-	
Median number of past history of suicide attempts (IQR)	0 (0 – 0)#	0 (0 – 0)	-	
Mean BDI-II (SD)	4.9 (5.32)*	9.0 (6.38)	3.5 (4.94)*	p = 0.004* p = 0.885 p < 0.001*
Mean YMRS (SD)	2.0 (2.10)*	0.2 (0.72)	0.2 (0.67)	p < 0.001* p < 0.001* p = 1.000
Mean BAI (SD)	6.1 (6.60)	14.4 (10.67)	6.5 (6.21)	p < 0.001* p = 1.000 p < 0.001*
Number of patients on antidepressants (%)	26%	86%	-	

Number of patients on mood stabilizer (%)	92%	0%	-	
Number of patients on benzodiazepines (%)	72%	71%	-	
Number of patients on antipsychotics (%)	21%	14%	-	

BDI-II = Beck Depression Inventory - II; YMRS = Young's Mania Rating Scale; BAI = Beck Anxiety Inventory

**ANOVA; $p < 0.05$; significant difference between groups*
*** t-test; $p < 0.05$; significant difference between the bipolar and depressed groups*
# Mann-Whitney test; $p < 0.05$

Table 2
Correlations between anxiety and imagery measures for the whole cohort of participants (n = 120)

	BAI	SUIS	Age
SUIS	-0.31*	1.0	-0.21*
IFES total	0.38*	0.17	0.02
IFES-intrusion	0.25*	0.25	-0.06
IFES-avoidance	0.42*	0.15	0.05
IFES-hypervigilance	0.37	0.15	0.06

SUIS= Spontaneous Use of Imagery Scale; IFES = Impact of Future Events Scale
**Pearson's correlation; $p< 0.01$; significant difference between groups*